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APPLIED FORESTRY NOTES

NORTHERN ROCKY MOUNTAIN
FOREST AND RANGE EXPERIMENT STATION

No. 88 Missoula, Montana November 1938

TAKING THE GUESS OUT OF CEDAR POLE INVENTORIES

Foreword

For years northern Idaho has been recognized as one of the leading cedar pole producing areas in the United States. With a current average production of 400 M poles, the annual revenue now aggregates about $1,500,000 and the industry provides employment to several thousand men each year.

In planning for the future any business man will agree that one of the first essentials is a reliable inventory of his available resources. As an aid to the lumberman in obtaining a detailed inventory of his cedar pole stands, the Forest Service has been endeavoring to work out a dependable method of determining the true height of cedar poles as well as the actual number. In doing so they have worked along lines comparable to those employed in cruising other tree species.

Such a system has finally been worked out by James W. Girard, Assistant Director of National Forest Survey, with the Growth Phase crew of the Forest Survey[1/] carrying out most of the field investigations. A discussion of this system is presented in the following pages.

1/ L. J. Cummings, Richard M. Varney, and Robert E. Swanson.

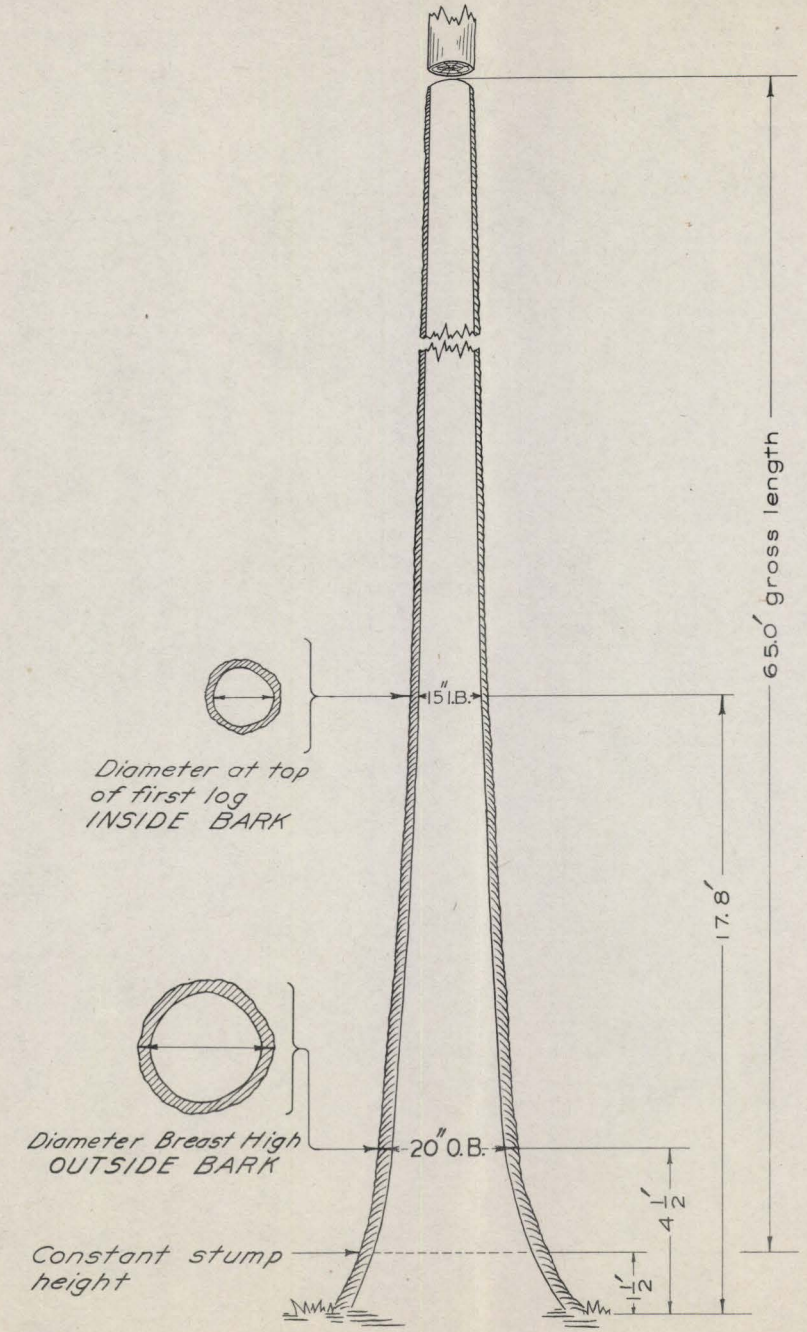


DIAGRAM EXPLAINING METHOD OF MEASURING GIRARD FORM CLASS

TO MEASURE FORM CLASS

(1) Measure diameter breast high outside bark

(2) Measure diameter inside bark at top of first log (16.3 ft.) above constant stump height of 1 1/2 feet.

(3) Divide D.I.B. at top of first log by D.B.H. outside bark to get form class.

EXAMPLE

20.0 = D.B.H. Outside bark
15.0 = D.I.B. Top first log
$\frac{15}{20}$ = FORM CLASS 75

General Discussion

Form class taper curves for cedar poles were devised in 1937 by James W. Girard, as a practical means whereby timber cruisers, even though inexperienced, can accurately estimate gross lengths of cedar poles. These curves have recently been used by cruisers of the Forest Survey in Region One in connection with a cedar increment study covering northern Idaho and northeastern Washington. In view of checks carried on in conjunction with the study which show that the curves give remarkably good estimates, this note dealing with the results obtained and technic worked out by the growth crew in using them is submitted.

The Girard form class is the ratio of the diameter inside bark at the top of the first 16-foot log to the diameter outside bark at breast high, expressed as a percent (see diagram). It is simply a measure of the amount of taper in the butt log in terms of the breast high diameter. Thus a tree with a form class of 75 has a butt log with a top diameter inside bark which is 75 percent of the outside bark measurement at breast height. A tree with more taper will have a smaller form class, while one with less taper will have a correspondingly higher form class.

This ratio, together with knowledge of the average taper characteristic in trees of given form classes, is the basis of form class curves. For example, trees of form class 75 have an average rate of taper which is expressed in the form class 75 curve on the attached graph. This method of cruising consists, then, of merely taking advantage of the fact that the size and form class will, on the average, indicate the length of the remainder of the bole.

Use of Curves

The data necessary to use the curves are the d.b.h. measurement and the estimated form class of the tree under consideration. The length of the pole is then read directly from the curves (see directions on attached graph). Deduction for rot, sweep, and other defect must be made from the gross length thus obtained. Since the success of the method depends largely upon a reasonably accurate estimation of form class, this is the most important and exacting part of the procedure. It has been our experience, however, that the ability to estimate form class sufficiently well is neither a difficult task to acquire, nor once attained is it hard to keep.

Two methods were used in developing this ability. The first consisted of visiting pole cutting operations to estimate the form class of trees about to be felled and to check these estimates on the down trees. The second and most practical method required the use of linesmen's climbers and belt and some means of determining bark thickness. Estimated form class of standing trees was checked by climbing to the top of the first 16-foot log length to measure diameter and bark thickness. The fact that it is independent of cutting operations and that it may be used on the specific areas makes climbing the preferred method.

Little training is necessary to develop the cruiser to a point where he can recognize form class. Members of the growth crew, entirely unfamiliar with form class, were able to consistently approximate the actual form class of sample trees after only a few measurements. If the cruiser will spend part of a day estimating and checking, then measure as few as two or three sample trees each day during the cruise, he will soon attain the proficiency needed for good use of the curves.

The fact that the range of form classes encountered in the field is small for a majority of the trees operates to make the estimation of form class easy. Ninety-two percent of nearly 400 trees measured fell within the 70 to 85 form class group, the average of all samples being 77. Within this range it is assumed that errors will be small and compensating. However, should the estimator miss the actual form class by as much as five points, examination of the curves will show that this will result in no serious error.

It should be pointed out that in cases of abnormal butt swell allowance should be made by taking the diameter measurement above the swell. In such cases, the top measurement should be taken at the regular height (17.8 feet above ground). The estimator should also pay particular attention to the matter of bark thickness at the 17.8-foot point until his experience enables him to recognize thick and thin bark, and the approximate allowances to make.

Results Obtained by the Use of Curves

Aside from the checks of form class estimation described above, two checks of the accuracy of the curves were carried on during the cedar growth study. One consisted of measuring with chain and Abney level the pole length of a sufficient number of trees on each cruise strip so that a comparison with estimates taken from the form class graph

was constantly available for each localized area. The other check was based on actual measurements of form class and gross pole length of trees, particularly those cut on various widely scattered pole-making operations, as well as some windfalls.

Samples from 9 drainages in the Kaniksu and 13 in the St. Joe and Clearwater areas were included in the latter check. Approximately 20 sample trees were measured in all but 4 drainages. Trees were taken at random from various elevations and aspects in an effort to eliminate personal bias from the selection of samples and to get a representative variation of growing conditions. Measurements taken for 374 poles show:

Estimated total linear feet using Girard's form class taper curves	= 20,258
Actual total linear feet	= 19,987
Difference	271

The difference represents an over-estimate of 1.4 percent given by the curves, or an average linear difference of +.72 feet per pole.

An analysis of the samples taken from pole-making operations where 20 or more measurements were made presents an interesting picture of the variation encountered.

Pole-making operation	Number of samples measured	Linear feet of pole: Total actual	Linear feet of pole: Total estimated from curves	Average error per pole in feet	Percent error
No. 1	60	3260.0	3236.5	-0.39	-0.72
No. 2	60	3129.0	3166.0	+0.62	+1.18
No. 3	39	2249.5	2235.5	-0.36	-0.62
No. 4	37	2118.0	2099.0	-0.51	-0.90
No. 5	20	1145.0	1110.0	-1.75	-3.06
No. 6	20	954.0	1010.5	+2.83	+5.92
No. 7	19	1077.0	1139.0	+3.26	+5.76
No. 8	20	1003.0	1067.0	+3.20	+6.38
No. 9	20	973.5	1020.0	+2.33	+4.78
No. 10	23	1348.5	1354.0	+0.24	+0.41

Whether coincidental or not, it is interesting to note the small errors of estimate for operations Nos. 1, 2, 3, and 4 on which from 37 to 60 measurements were taken in an effort to get a representative sample of the drainage as to slope, aspect, elevation, and other site conditions.

Practical Suggestions

A few suggestions which may aid in the use of the curves:

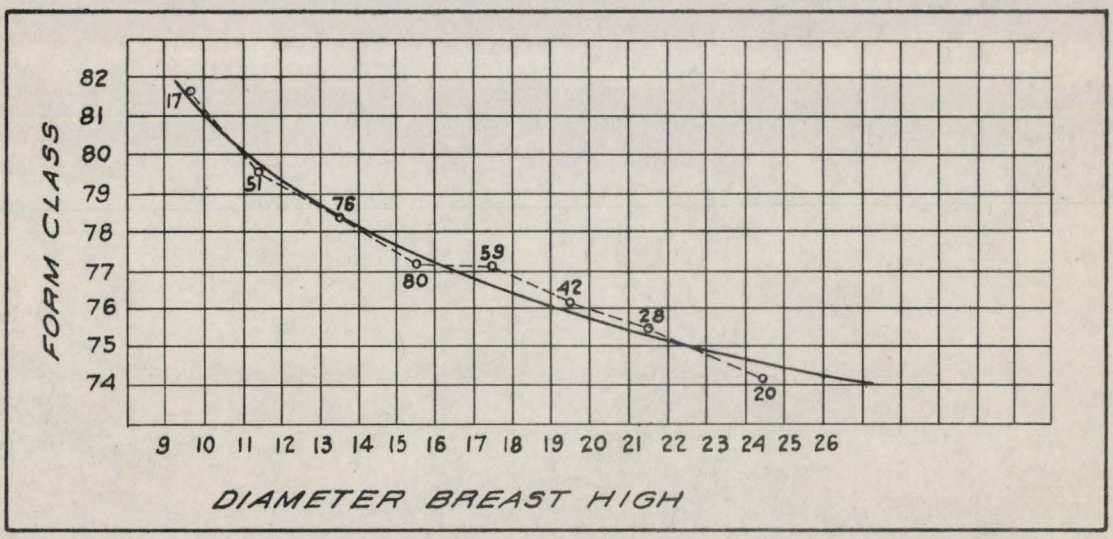
1. The fact that the estimated length obtained from the curves is the gross figure from which necessary deductions for defect are taken must be kept well in mind.

2. It is desirable to employ an Abney check of estimated pole lengths so that adjustment may be made for local variation. Where possible, however, measurement of cut trees or windfalls is better. An occasional check by these means will enable the cruiser to add or subtract the 5- or 10-foot length necessary to allow for individual differences.

3. Form class for a localized area is usually consistent, but varies considerably from hilltop to stream bottom, the higher form classes occurring more often in the bottoms.

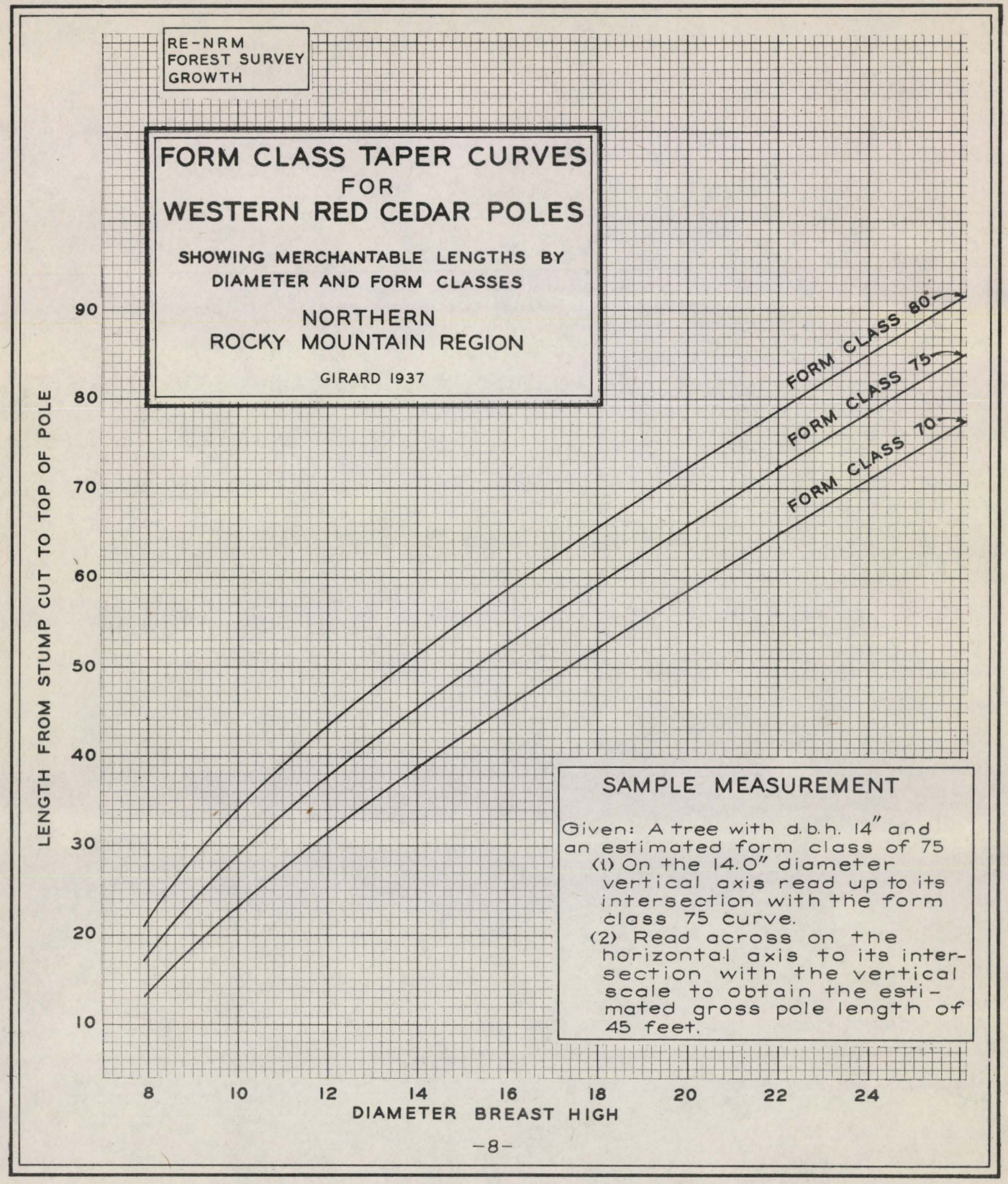
4. In even-aged stands, which occupy by far the greater part of commercially important cedar-pole areas, the smaller trees have higher form classes than the larger, more buttressed trees. This statement is borne out by graph 2 which is based on all samples measured in this study.

Graph 2. - Relationship of form class to d.b.h. in even-aged cedar pole stands



Conclusion

In view of the results obtained from the checks made in connection with the cedar pole growth study, Girard's form class taper curves are recommended as a highly useful aid in the cruising of cedar poles in Region One.


RE-NRM
FOREST SURVEY
GROWTH
FORM CLASS TAPER CURVES
FOR
WESTERN RED CEDAR POLES
SHOWING MERCHANTABLE LENGTHS BY
DIAMETER AND FORM CLASSES
NORTHERN
ROCKY MOUNTAIN REGION
GIRARD 1937
LENGTH FROM STUMP CUT TO TOP OF POLE
10
20
30
40
50
60
70
80
90
8
10
12
14
16
18
20
22
24
DIAMETER BREAST HIGH
FORM CLASS 80
FORM CLASS 75
FORM CLASS 70
SAMPLE MEASUREMENT
Given: A tree with d.b.h. 14" and an estimated form class of 75
(1) On the 14.0" diameter vertical axis read up to its intersection with the form class 75 curve.
(2) Read across on the horizontal axis to its intersection with the vertical scale to obtain the estimated gross pole length of 45 feet.